Strategy

January 2007

Authority

The Secretary of Energy has authorized the Research Partnership to Secure Energy for America (RPSEA) "to carry out a program … of research, development, demonstration, and commercial application of technologies for ultra-deepwater and unconventional natural gas and other petroleum resource exploration and production, including addressing the technology challenges for small producers, safe operations, and environmental mitigation (including reduction of greenhouse gas emissions and sequestration of carbon)."

Targeted Areas and Goals

RPSEA should carry out the activities listed above to maximize the value of natural gas and other petroleum resources of the United States in order to support America's economic growth, job creation, and its international leadership in energy science and technology by:

- Increasing the supply of such resources,
- Reducing the costs to find, develop and produce such resources,
- Increasing the efficiency of exploration of such resources,
- Increasing the efficiency of production of such resources,
- Improving safety, and
- Improving environmental performance, by reducing significantly any environmental impacts associated with ultra-deepwater and unconventional natural gas and petroleum resource exploration and production, and enhancing the nation's capacity to reduce greenhouse gas emissions and sequester carbon.

Measures of Success

RPSEA must develop metrics that can be used to measure the success of the program. The metrics should address the following issues:

- The metrics should be organized using a time scale. The metrics used to measure success after the first year should not necessarily be the same metrics used to measure success after the fifth or tenth year. Metrics in the first and fifth year should provide distinct mileposts and a clear pathway toward meeting key goals in year 10. First and

second year goals would necessarily be more process/activity oriented. Fourth and fifth year goals should focus on program and technical results.

- All metrics should be clear and measurable.
- A portion of the metrics should be used to measure the science and capacity building value of the program.
- A portion of the metrics should be used to measure how much of the technology is adopted and used in the industry over a sustained period of time.
- A portion of the metrics should be used to measure the degree of participation and support of industry in the initial research and the ultimate utilization by industry of the resulting technology.
- All metrics should be linked to one or more of the goals listed above.
- Environmental metrics should be incorporated at all program/project levels

Theme Development

Figure 1 illustrates a process that has been used by DeepStar to develop research themes for its research programs; the SAC felt that this represented a reasonable starting point for RPSEA program development. The process should include a range of typical problems expected in ultra deepwater or unconventional natural gas reservoirs and ideas for addressing the problems identified. The process should look at the science needed to derive new solutions, the definition and approach to developing enabling technologies, and the definition of enhancing technologies. In addition, the process should describe the grand challenges that could lead to break through technologies.

Fig. 1 – Research Focus Process

Unconventional Resources

Resource	Key Challenges	Potential Approaches
Tight Sands	Reservoir-Well Connectivity	1. Low-cost, low impact wells 2. Improved hydraulic fractures 3. Novel stimulation methods 4. Advanced well construction such as multi-lateral, pinnate
	Fracture Detection/Prediction	1. Advanced seismic imaging 2. Structural geologic modeling 3. Long-range crosswell imaging 4. Integrated geophysical methods
Coalbed Methane	Produced Water Management	1. Reduce water production 2. Sustainable beneficial use 3. Treatment and disposal
Shale Gas	Resource Evaluation	1. Models of fluid storage and flow in shales 2. Determine controls on reservoir producibility 3. Advanced core and log measurement and analysis methods.
	Reservoir-Well Connectivity	1. Low-cost, low impact wells 2. Improved hydraulic fractures 3. Novel stimulation methods 4. Advanced well construction such as multi-lateral, pinnate
	Water Management	1. Reduce water production 2. Reduce water use during drilling and stimulation 3. Develop life-cycle water treatment and management approaches

Grand Challenges for Unconventional Resources

1. Subsurface permeability imaging
2. Low cost/low surface impact well construction
3. Improve the hydraulic connection between the wellbore and the reservoir

Annual Plan Development

The development of the Annual Plan will involve a process in which RPSEA seeks the broadest possible input from members and non-members alike (industry, academia, NGO's, VC's, etc). The SAC strongly recommends that any input from non-members to the Annual Plan be "sponsored" by RPSEA members.

The annual research plan should be written by the President of RPSEA in consultation with the Executive Committee of the Board of Directors. Input to the plan should be solicited from the RPSEA members, member forums, the Technical Advisory Committees, and other meetings hosted by RPSEA. RPSEA staff will specifically seek input from the TACs in the development of the Annual Plan. PAC involvement in the development of the Annual Plan will be limited to directing certain high level objectives or principles. The TACs will not only be a valuable source for technical input for the development of the annual research plan, but also for technology transfer activities, and the development of technical metrics.

Project Selection

The process of Annual Plan Development should be entirely separate from project recommendations. Project funding recommendations will be made by the Program Advisory Committees (PACs) pursuant to the direction from the Annual Plan and shall include technical input from the TACs on specific technical issues.

The SAC assumes that PAC processes for project selection will vary slightly by program element (See Table below). The Program Advisory Committees will be the primary group that will evaluate the proposals and make recommendations to the Board of Directors on which projects to fund.

	Industry Structure	Research Management Implications
Ultra-Deepwater Program	• Relatively small number of industry players • Significant capital requirements • Consistent regulatory environment • Some internal research capability • Ready adoption of new technology • Very high cost high risk working environment	• Focus on infrastructure/ harsh environmental conditions • Setting priorities with industry input critical to success • Potential to provide significant cash matching funds • Demonstration is very expensive. High value on risk avoidance forces limited number of focus areas • Formal collaborative research model exists
Unconventional Onshore Program Element	• Large number of players, some very small • Limited access to capital • Multiple regulatory jurisdictions • Limited internal research capability • Ability to adopt new technology varies • Technology issues vary considerably with geographic/ geologic area.	• Focus on geology/ environmental implications • Need to identify and pursue specific resource targets • Little potential for cash matching funds but history of in-kind contributions • Formal tech transfer mechanisms exist • Historical but not current formal collaborative research model • Research programs need to be designed with geographic area and technology user in mind.
Small Producer Program Element	• Number of small producers is 8000 and growing • Limited access to capital • Multiple regulatory jurisdictions • No internal research capability • Most do not have capability to internalize new technology. • Small producers are threatened by technical, environmental, and market challenges	• Focus on geology, environmental, regulatory compliance, cost reduction • Must work with small producers to identify issues that impact small producers across and within regions • Little potential for cash matching funds but history of in-kind contributions • Formal tech transfer mechanisms exist • Some successful examples of collaborative research exist • Small producers may lack the staff to internalize complicated technology, so tech transfer must involve appropriate service providers.

Research Portfolio

RPSEA should have a research portfolio that consists of only 5-10 core areas, with percentage allocation limitations. RPSEA research portfolio should reflect time scales and the research continuum from basic to applied to demonstration to commercialization. Also the portfolio should be organized around "Science R&D, Enabling and Enhancing" themes.

All projects awarded should fit into a core area and address one or more of the goals set forth by the US Congress and listed above. The portfolio should have projects which focus on the short term (1-2 years), the medium term (2-5 years), and the long term (6-10 years). The portfolio should include a few, well funded projects at the top of the pyramid, although these projects may not be known in the initial planning year. There are assumed to be a large number of research projects at the base of the pyramid. These projects should generally be considered seed projects, some of which will grow into larger projects as warranted; it is assumed that these projects will generally be funded at lower amounts than those at the top of the pyramid. RPSEA should recognize that some projects will fail and articulate this in its Annual Plan. All projects should identify likely "follow-on" capital needs in order to enhance the focus on commercialization potential.

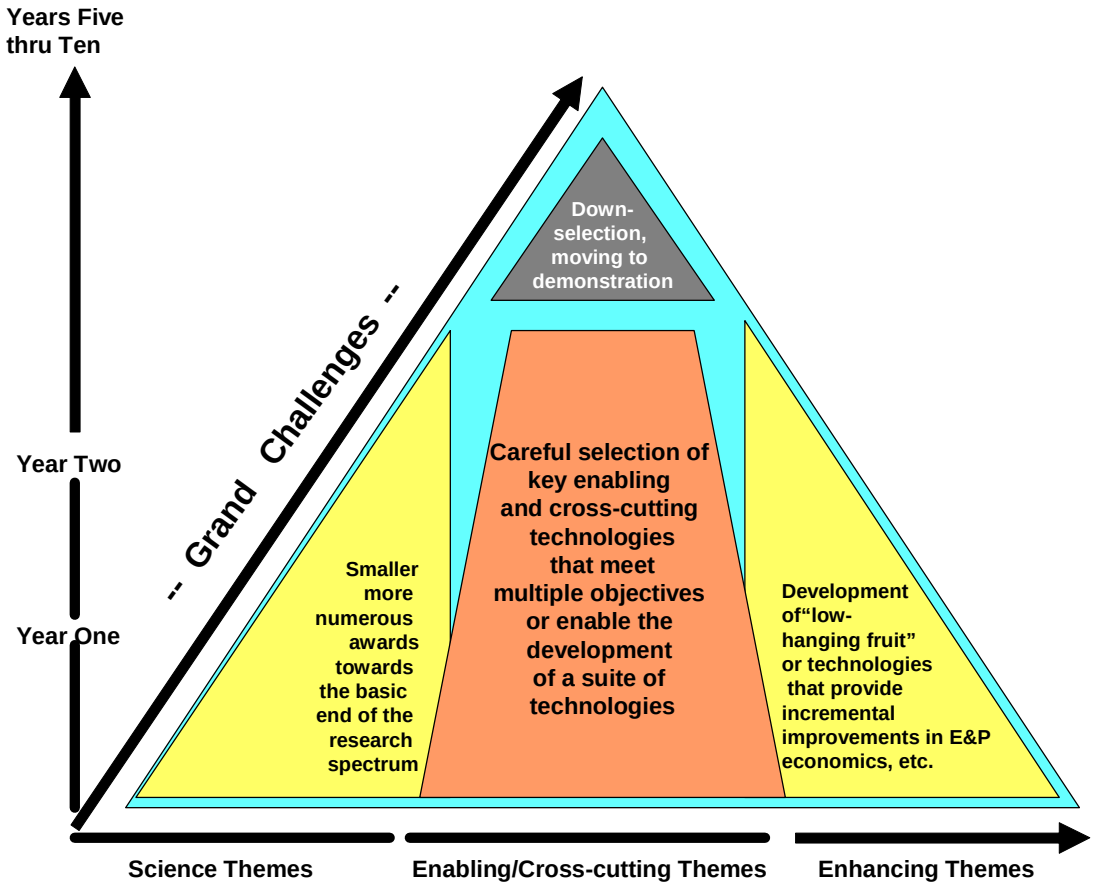
As RPSEA matures, the strategy should naturally evolve to funding fewer projects that provide the best opportunity for developing technology that will make the highest contribution to achieving the goals set forth above in this document. We envision the weaker projects will be terminated as the stronger projects take over more of the budget.

The portfolio should be developed using a matrix concept involving resources areas and time with technology areas, as shown in **Fig. 2**. The research portfolio will be stronger if it is developed by considering the effect of each project in the context of how it contributes to by the technology spectrum and how it will be applied in specific resource areas. **Fig. 2** provides a simple example of a resource/time matrix, and the actual matrices developed by the Technical Advisory Committees are expected to be much more detailed than the example below. However, when the actual matrices are developed, they should clearly show the gaps and needs of the industry.

Fig. 2 – Example Matrix for Project Development and Evaluation

Resource **Time Scale**	Shale Gas	Coalbed Methane	Tight Gas
Existing Play	(Resource Example/Required Technology)		
Emerging Resource			
Frontier Area			

The portfolio should also reflect research that would enhance opportunities to meet program objectives but are not achievable due to funding limitations.



Outreach

RPSEA must work to educate both the professionals in the upstream oil and gas business and the general public on the issues surrounding technology development and deployment, and the corresponding benefits to the public interest. By working with industry, RPSEA can aid in technology transfer and deployment by demonstrating how to use key technologies as they are developed. In order to attract highly skilled energy technologists to replenish the workforce and encourage innovation, RPSEA should help educate the general public on the upstream oil and gas industry as a high technology, global industry that represents significant employment opportunities for skilled scientists and engineers. In short, RPSEA can be instrumental in advancing the "high technology" aspects of the natural gas and oil exploration and production industries sufficient to attract the best young minds in the energy technology industry.